both ages. The classes defined at 14 used different criteria but can be approximated to the present grades. Of the 14 year old group as a whole 32% had been wheeze free for at least three years when seen at 28 years with 27% of the group continuing to wheeze at least once a week. A further 41% complained of less frequent wheezing. Recurrence of wheezing had occurred in 27% of those with minimal symptoms at 14. These figures are in broad agreement with some earlier studies; of the prospective studies, Johnstone[1] found that 25% of his group had ceased wheezing, while Blair[2] in a larger study reported that 28% had had no asthma for more than two years before the review. He also stated that 48% had continued to have chronic asthma but this may have reflected an initial bias in selection. A number of retrospective studies of sufficient length have been reported. Rackemann and Edwards[18] found that 31% of their subjects reported being "cured," while 10·9% still suffered "severe" asthma. Buffum and Settipane, however, who studied a group of private patients, found that 41% were wheeze free after 10 years and 55% after 20.[21] Similar remission rates were found by Barr and Logan[27] and Ogilvie.[20] These studies relied on questionnaires to obtain their data, and there was no interview, examination, or lung function testing for objective evidence of airways obstruction.

Contrary to the findings at 21 years of age, significantly more men than women (28% *v* 19%) suffered a worsening of their asthma, reversing the trend for the sexes to be more evenly distributed in the most severe group. Other studies that have followed subjects into adulthood have found either no sex difference in prognosis[2 3 24] or that women tended to wheeze more than men.[27]

The symptomatic groups were still undertreated by the criteria of Martin *et al.*[11] Only in the most severe group had there been any improvement in the numbers deemed to be adequately treated. These findings are of concern as it is possible that the degree of fixed airways obstruction may be altered over time with adequate bronchodilatation.[28] Of concern also was that many of the subjects with asthma continued to smoke. In the two most severe groups 42% and 41% respectively were smoking, with potentially important effects on their airway reactivity and small airway function.

In summary, we have presented data on a group of subjects who had asthma in childhood and who had been followed from the ages of 7 to 28 years with a 77% recall rate. We have classified our group according to their frequency of wheezing and found that this classification correlated with the presence of other features of the disease. The prognosis for those with frequent wheezing in early adolescence is poor, with most still in the most severe group at 28 years. There is evidence that wheezing recurs in early adult life, suggesting that the prognosis for those with mild asthma may not be as favourable as popularly thought.

We thank Joan Raven and Anna Lanigan for their technical help.

References

1 Johnstone DE. A study on the natural history of bronchial asthma in children. *Am J Dis Child* 1968;115:213-6.
2 Blair H. Natural history of childhood asthma: 20 year followup. *Arch Dis Child* 1977;52:613-9.
3 Pearson RSB. Asthma, allergy and prognosis. *Proceedings of the Royal Society of Medicine* 1967;61:467-70.
4 Beck GJ, Doyle CA, Schacter EN. A longitudinal study of respiratory health in a rural community. *Am Rev Respir Dis* 1982;125:375-81.
5 Broder I, Higgins MW, Matthews KP, Keller JB. Epidemiology of asthma and allergic rhinitis in a total community, Tecumseh, Michigan: IV natural history. *J Allergy Clin Immunol* 1974;54: 100-10.
6 Schacter EN, Doyle CA, Beck GJ. A prospective study of asthma in a rural community. *Chest* 1984;85:623-30.
7 McNicol KN, Williams HE. Spectrum of asthma in childhood—I, clinical and physiological components. *Br Med J* 1973;iv:7-11.
8 McNicol KN, Williams HE. Spectrum of asthma in childhood—II, allergic components. *Br Med J* 1973;iv:12-6.
9 McNicol KN, Williams HE. Spectrum of asthma in childhood—III, psychological and social components. *Br Med J* 1973;iv:16-20.
10 Martin AJ, McLennan LA, Landau LI, Phelan PD. The natural history of childhood asthma to adult life. *Br Med J* 1980;280:1397-400.
11 Martin AJ, Landau LI, Phelan PD. Asthma from childhood at age 21: the patient and his disease. *Br Med J* 1982;284:380-2.
12 Martin AJ, Landau LI, Phelan PD. Predicting the course of asthma in children. *Aust Paediatr J* 1982;18:84-7.
13 Martin AJ, Landau LI, Phelan PD. Lung function in young adults who had asthma in childhood. *Am Rev Respir Dis* 1980;122:609-16.
14 Martin AJ, Landau LI, Phelan PD. Natural history of allergy in asthmatic children followed to adult life. *Med J Aust* 1981;ii:470-4.
15 Goldman HI, Becklake MR. Respiratory function tests. *Am Rev Respir Dis* 1959;79:457-66.
16 Ferris BG, Anderson DO, Zickmantel R. Prediction values for screening tests of pulmonary function. *Am Rev Respir Dis* 1965;91:252-61.
17 Williams HE, McNicol KN. Prevalence, natural history and relationship of wheezy bronchitis and asthma in children: an epidemiological study. *Br Med J* 1969;iv:321.
18 Rackemann FM, Edwards MC. Asthma in children. A follow up study of 688 patients after an interval of 20 years. *N Engl J Med* 1952;246:815-23.
19 Bullen RS. Some observations on the natural history of asthma in childhood. *NY State J Med* 1929;29:545-9.
20 Ogilvie AG. Asthma: a study in prognosis of 1000 patients. *Thorax* 1962;17:183-9.
21 Buffum WF, Settipane GA. Prognosis of asthma in childhood. *Am J Dis Child* 1966;112:214-7.
22 Dodge RR, Burrows B. The prevalence and incidence of asthma-like symptoms in a general population sample. *Am Rev Respir Dis* 1980;122:567-75.
23 Peat JK, Woolcock AJ, Leeder SR, Blackburn CRB. Asthma and bronchitis in Sydney schoolchildren. I. Prevalence during a six year study. *Am J Epidemiol* 1980;111:721-7.
24 Ungar L. Bronchial asthma: under observation from one to thirteen years. *Journaal of Allergy* 1935-6;7:364-71.
25 Speight ANP, Lee DA, Hey EN. Underdiagnosis and undertreatment of asthma in childhood. *Br Med J* 1983;287:949-5.
26 Marks BE, Hillier VF. General practitioners' views on asthma in childhood. *Br Med J* 1983;287:949-5.
27 Barr LW, Logan GB. Prognosis of children having asthma. *Pediatrics* 1964;34:856-60.
28 Brown PJ, Greville HW, Finucane KE. Asthma and irreversible airflow obstruction. *Thorax* 1984;39:131-6.

(Accepted 12 February 1987)

SHORT REPORTS

Lyme arthritis in southern England

Lyme disease is an infection with the spirochaete *Borrelia burgdorferi*. Its arthritic and neurological manifestations are often preceded by a characteristic skin eruption, erythema chronicum migrans. The tick vector, most commonly *Ixodes ricinus*, is widespread in North America and Europe. Joint disease, well recognised in the United States,[1] has not been reported in the United Kingdom, although cases from East Anglia,[2] Scotland, and Southampton[3] have presented with erythema chronicum migrans alone or with neurological manifestations. We report a case of Lyme disease presenting with an asymmetric oligoarthritis after an insect bite.

Case report

In June 1986 a 55 year old woman noticed an insect bite on the left calf while playing golf near Southampton. Three days later her left ankle became painful and swollen. After a further four days she developed a feverish illness with a sore throat and non-productive cough; she was treated with a seven day course of oral phenoxymethylpenicillin 250 mg four times daily. Generalised joint pains and swelling of both hands occurred two weeks after the bite followed by similar manifestations in one shoulder, the knees, ankles, and forefeet. Morning stiffness, lasting about 30 minutes, was partly relieved by ibuprofen 400 mg thrice daily. She had previously been well with no ocular, bowel, or urogenital symptoms and had not been abroad.

She was admitted because of continuing pain two months after the insect bite. There was a macular area of faint erythema about 5 cm in diameter on the left calf, active synovitis of the proximal interphalangeal joints and the metacarpophalangeal joints of both hands, and considerable bilateral flexor tenosynovitis. The right temporomandibular joint, right shoulder, and both knees and ankles were affected. Cardiac and neurological examination gave normal findings.

Her haemoglobin concentration was 129 g/l, the white cell count $7{\cdot}4\times10^9$/l, and platelet count 339×10^9/l. The erythrocyte sedimentation rate was 35 mm in the first hour. Concentrations of rheumatoid and antinuclear factors, cryoglobulins, and complement were normal. Serological tests for chlamydia, parvovirus (IgM), antistreptolysin O, *Yersinia enterocolitica*, and syphilis were negative. *x* Ray films of the hands and feet showed no erosive changes. A chest radiograph and electrocardiogram were normal. Serum titres of IgG antibodies against *B burgdorferi* by indirect immunofluorescence were 1/512 and 1/1024 in samples taken three and 10 weeks respectively after the onset of arthritis. (Titres below 1/256 are considered not significant.)

The arthritis gradually resolved after treatment with bed rest, splintage, and oral diclofenac. A two week course of oral phenoxymethylpenicillin 500 mg four times a day was administered after confirmation of the diagnosis.

Comment

This case of Lyme disease was acquired in the Southampton area of England; Lyme disease presenting as meningitis was recently reported from the same area.[3] The presentation in early summer reflects the seasonal variation of erythema chronicum migrans and the feeding cycle of the tick.[2]

The prominent synovial inflammation in this case is in keeping with the North American pattern of Lyme disease,[1] in contrast with the preponderance of cutaneous and neurological manifestations described in European cases. Differences have been shown between isolates of protein from European and American strains of *B burgdorferi* and may explain this variation in the clinical pattern.[4]

The importance of Lyme disease lies in its high relapse rate and progression, if untreated, to a chronic erosive arthropathy in a tenth of cases.[5] The diagnosis is readily confirmed by serology. Treatment with high doses of penicillin reduces the frequency and severity of recurrence; intra-articular steroids may have deleterious effects in affected joints and should be avoided.[5]

Lyme disease should be considered in any patient presenting with a history of insect bite and a seronegative arthropathy.

We thank Dr D J M Wright, of Charing Cross Hospital, for performing *B burgdorferi* serology.

1 Steere AC, Malawista SE, Hardin JA, *et al*. Erythema chronicum migrans and Lyme arthritis: the enlarging clinical spectrum. *Ann Intern Med* 1977;86:685-98.
2 Muhlemann MF. Thirteen British cases of erythema chronicum migrans, a spirochaetal disease. *Br J Dermatol* 1984;111:335-9.
3 Bateman DE, White JE, Elrington G, Lawton NF, Muhlemann MF, Greenwood RJ. Three further cases of Lyme disease. *Br Med J* 1987;294:548-9.
4 Barbour AG, Heiland RA, Howe TR. Heterogeneity of major proteins in Lyme disease borreliae: a molecular analysis of North American and European isolates. *J Infect Dis* 1985;152:478-84.
5 Steere AC, *et al*. Successful parenteral penicillin therapy of established Lyme arthritis. *N Engl J Med* 1985;312:869-74.

(Accepted 3 February 1987)

Rheumatology Unit, Battle Hospital, Reading RG3 1AG
DEREK C MACALLAN, BA, MRCP, registrar
CARLY ANNA HUGHES, BA, MB, senior house officer
ANTHONY BRADLOW, MD, MRCP, consultant

Correspondence to: Dr Macallan.

Auditory rehabilitation: should we listen to the patient?

Presbyacusis is part of aging: socially important impairment of hearing increases with age so that almost two thirds of people aged over 70 are likely to be affected.[1] Only a minority of people with impaired hearing in Britain seek help, however, most of them from the National Health Service. Some of these patients will receive a hearing aid; 460 000 postaural aids were issued in 1985, at a cost of £14m for the appliances alone. Estimates of the need far exceed demand, which already overstretches present resources.[2] A paradox exists, however, in that up to a fifth of these aids are not used within six months of issue and a further fifth are underused in that time.[3]

Evidently there is a discrepancy between the patient's use of a hearing aid and the doctor's optimism in prescribing it. Audiological and ergonomic reasons for non-use have been well documented, and various rehabilitation procedures designed to overcome these difficulties have been evaluated.[4] In general, however, the results have been disappointing, which has led to speculation that the criteria for issuing hearing aids should be reviewed.[5] To investigate the relation between patients' characteristics (including their attitudes and expectations) and their subsequent use of hearing aids we carried out a prospective study of elderly patients attending one hearing aid centre.

Patients, methods, and results

Before they were issued with a hearing aid 200 elderly patients attending St Helier Hospital's audiology clinic were assessed in terms of their hearing impairment, disability and handicap, attitude towards their forthcoming hearing aid, and expectations of benefit. Six months after the issue of the aid the degree of use and satisfaction were assessed. All assessments were by self completed questionnaires derived from the Medical Research Council's national hearing survey. The results of audiography were recorded as the average loss in the better ear over the range 0·5 to 4 Hz. Because the catchment area of the hearing aid clinic covered three health districts, each with its own rehabilitation service, a "natural experiment" of the effectiveness of different follow up services was conducted.

Association between patient characteristics and outcome of the issue of their hearing aid in 146 patients

	Satisfaction (r)	Frequency of use (r)	No of patients who expected that the hearing aid would help with this activity (%)
Impairment	0·15	0·02	
Disability	0·08	0·08	
Handicap	0·03	0·02	
Initial attitudes	0·19*	0·12	
Prediction of use	0·21*	0·12	
Achievement of expected benefit†			
Telephone	0·48**	0·15	91 (62)
Television	0·62**	0·33**	133 (91)
Radio	0·68**	0·43**	121 (83)
One person	0·70**	0·52**	104 (71)
Group	0·58**	0·14	131 (90)
Type of postaid rehabilitation‡	0·21	0·33*	

r=Spearman's rank correlation coefficient.
* $p<0·05$, ** $p<0·001$.
†Degree of help experienced in an activity in which the individual had expressed difficulty before the issue of the aid and in which he expected the hearing aid to help.
‡Range varied from no active follow up (problem clinic only) to follow up by professional therapists using a regular monitoring system.

A total of 146 (73%) patients completed both questionnaires. Nine patients died during the study period. The mean age of patients was 72, with 60% women. Some 112 (77%) had a hearing loss of 35 db or greater. Ninety seven (66%) thought that the forthcoming hearing aid was a good idea; 42 (29%) were doubtful; and seven (5%) did not want it. Eighty six (59%) expected to use it all the time, 58 (40%) occasionally, and one (1%) not at all. After six months 12 (8%) patients had stopped using the aid completely; 87 (60%) used it occasionally, 31 (21%) often, and 16 (11%) all the time. The average reported daily use was 3·8 hours. Eighteen (12%) patients were not at all satisfied with the hearing aid, 17 (12%) a little satisfied, 61 (42%) moderately satisfied, and 50 (34%) very satisfied. The degree of hearing impairment, disability, and handicap did not correlate with the levels of satisfaction or frequency of use (table); nevertheless, expected benefit was strongly associated with a successful outcome. Comprehensive rehabilitation given after the hearing aid had been supplied was associated with an increase in the frequency of use but not with increased satisfaction. Those patients who had expected to use the aid infrequently were the most satisfied.

Comment

Rather more of our patients had a hearing loss of 35 db or more than the proportion found in an earlier study (77% and 66%, respectively).[1] Our study confirmed the clinical impression that patients have considerable expectations of the benefits to be obtained from a hearing aid. It suggests that a counselling service before these are supplied, exploring individual patients' requirements and identifying realistic expectations, would be more effective in improving a hearing aid service than concentrating solely on a follow up rehabilitation programme. Historically the decision to refer to an ear, nose, and throat surgeon has been based on the degree of impairment and disability the patient experiences. The poor correlation between these variables and the subsequent outcome, together with the considerable overlap in the levels of impairment found in the clinic and general elderly populations,[1] indicate that these criteria are no longer valid for an aging population. Deafness in such people should not be considered an illness. Why should the doctor treat hearing impairment differently from the other common age related sensory deficit, visual impairment? The relationship between the ear, nose, and throat surgeon and the audiologist could be modelled on that of the ophthalmologist and the optician. Referral to an audiology clinic could be initiated by either the patient or the general practitioner and the onus would be on the audiologist to provide assessment, counselling, and a hearing aid if appropriate.

We thank Professor Haggard for allowing us to use the MRC questionnaires, S B Gunn and G C Westover for collecting the data, and Dr Mary Spenceley for instigating the study.

1 Herbst KG, Humphrey C. Prevalence of hearing impairment in the elderly living at home. *J R Coll Gen Pract* 1981;31:155-60.